

# THE MINERAL ASSEMBLAGE ANDALUSITE-CORUNDUM FROM “LA AURORA” PEGMATITE FROM MAZÁN PEGMATITIC FIELD, NORTHWESTERN ARGENTINA

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## ABSTRACT

It is the first mention of the andalusite-corundum paragenesis in the pegmatites from the Mazán pegmatitic field of the Pampean Pegmatitic Province. This paragenesis has been found into the K-feldspar zone of the “La Aurora” pegmatite, which has spatial relationship with the strongly peraluminous Mazán Granite. The genetic studies on the pegmatite are preliminary, but according to the literature data, “La Aurora” pegmatite could have been formed from supracortical H<sub>2</sub>O-saturated peraluminous melts. The cell parameters (in Å) of andalusite and corundum were determined by means of XRD. The mean value determined for andalusite are  $a_o = 7,794$ ;  $b_o = 7,897$ ;  $c_o = 5,554$  and for corundum  $a_o = 4,754$ ;  $c_o = 12,993$ .

**Keywords:** Andalusite-Corundum, La Aurora Pegmatite, Mazán Pegmatitic Field, Argentina

## INTRODUCTION

“La Aurora” pegmatite integrates the Mazán pegmatitic field from the Pampean Pegmatitic Province. It is located in the NE area of the Mazán range, beside route 10 at the south of the Villa Mazán, La Rioja Province, Argentina (Fig. 1). Andalusite, together muscovite and corundum, can be found into the K-feldspar-rich zone. Corundum has been identified by X-ray diffraction. The object of this paper is to describe the geological context and mineralogical characteristics of the mineral assemblage andalusite-corundum and to present a preliminary discussion about their genetic particularities.

## GEOLOGICAL SETTING

The Mazán range is located in the Sierras Pampeanas Province. Geologically, the studied area (Fig. 1) is dominated by the Mazán Granite. It is two-mica granite, which has porphyritic texture with megacrystals of perthitic microcline. Cordierite appears among the accessory minerals. It is a strongly peraluminous granite, always with ASI > 1 (Schalamuk et al. 1989, Toselli et al. 1991).

The host rocks are metasedimentary and the Mazán Granite contains enclaves attributed to the same lithology. The U-Pb SHRIMP age is  $484.2 \pm 3.1$  Ma

(Pankhurst et al. 2000). Toselli et al. (1991) concluded that the Mazán Granite comes from magmatism generated in the middle crust or at greater depths (minimum pressure of 5-6 kbar) and with a superficial setting (about 680-690°C and 1.5 kbar).

### “LA AURORA” PEGMATITE

It has an ellipsoidal shape with 45 m length and 15 m width. The general direction is N-S varying to NNW direction in the northern part of the body (Fig. 1). The geographical coordinate are 28°42'49.8"S - 66°34'14.8" W.

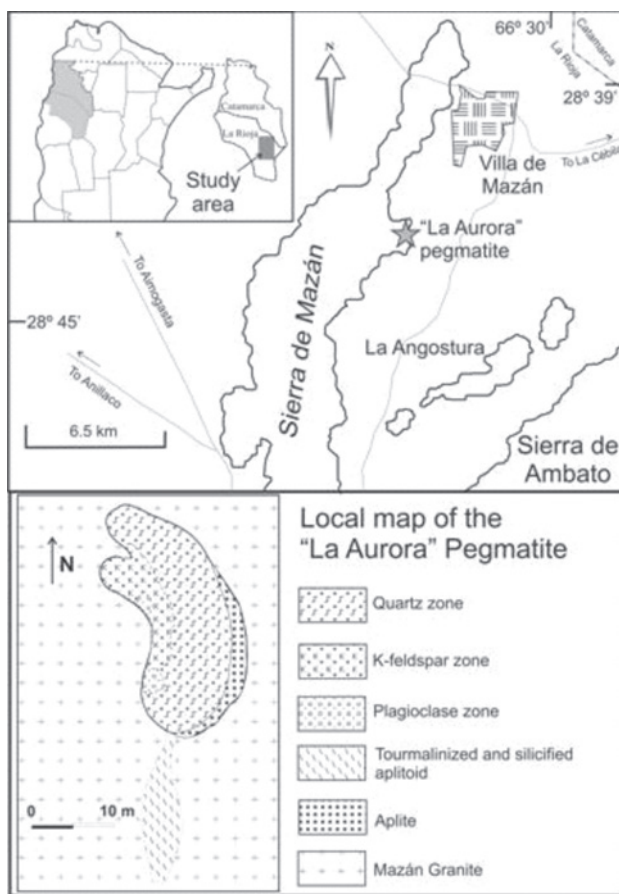


Figure 1- Regional and local map of the “La Aurora” pegmatite.

“La Aurora” pegmatite is a zoned body. The eastern border is composed of aplite of variable thickness, but do not exceed 2 m. The aplite has hypidiomorphic equigranular texture, fine to medium grained, with accessory muscovite, which

appears locally in laminar books up to 8 mm. At the south end of “La Aurora” and in an area of around 100 m along strike of the pegmatitic body, appears a rock similar to the aplite, which lithology correspond to an equigranular, fine-grained, tourmalini-

nized and silicified granite. The K-feldspar zone is essentially composed by perthitic microcline and very scarce plagioclase. The microcline:plagioclase ratio in this zone is around 12:1. Muscovite, scarce tourmaline and andalusite may appear in the K-feldspar. The plagioclase zone is subordinate to the former.

The quartz core, which forms a positive relief in the area, is the dominant zone. Besides quartz, it only contains tourmaline and scarce muscovite. The modal proportions among each of the zones and among minerals are shown in the Table 1.

## DESCRIPTIVE AND ANALYTICAL MINERALOGY

The andalusite is disseminated in the K-feldspar zone forming nodular accumulations. Garrido et al. (1984) point out that the mineral appears as fibrous-radials aggregates up to 50 cm length into the intermediate zones and in the border of the pegmatites from the neighbouring range of Ambato, at east of the Mazán range.

Table 1. Zones and modal composition of the "La Aurora" pegmatite, Mazán pegmatitic field.

Zone		Aplite border	Plagioclase	K-feldspar	Quartz
Proportion in the body		12,0 %	3,4 %	16,0 %	68,6 %
Texture		Fine-medium grained	Very coarse grained (pegmatitic texture)		
Mineralogy	Quartz	61.8 %	3.7 %	2.65 %	98.9 %
	Perthitic microcline	15.5 %	2.8 %	87.6 %	--
	Plagioclase	20.6 %	88.8 %	7.1 %	--
	Muscovite	2.1 %	3.7 %	1.8 %	0.5 %
	Apatite	tr	--	--	--
	Tourmaline	--	0.9 %	--	1.0 %
	Andalusite	--	--	0.9 %	--
	Corundum	--	--	tr	--

NOTES: tr: trace amount, less 0.1 %.

The andalusite from "La Aurora" has a reddish brown color. It has non-metallic shine, prismatic habit and frequently shows longitudinal grooves. The crystals are some centimeters to a decimeter in length with a nearly square basal section of about 4 cm. Solid inclusions of laminated white mica, up to 6 mm of width, occur in the andalusite crystals.

The corundum appears closely associated to andalusite, where it is disseminated into the prismatic andalusite. It is blue color, sometimes with black tint. The mineral appears as anhedral to subhedral crystals up to 4 mm in size. Sometimes shows a lengthen disposition parallel to the grooves of the prismatic andalusite. X-ray powder diffraction

(XRD) analysis of corundum was performed on manually picked grains under binocular stereomicroscope. It has been identified by using a Rigaku Dmax IIC automatic powder diffractometer with JADE v.7 analysis software. Copper  $K\alpha$  radiation was used, and the  $K\alpha_2$  contribution was stripped by a graphite monochromator. The powder XRD patterns were made over a diffraction-angle ( $2\theta$ ) range of  $3^\circ$  to  $60^\circ$ , with a step size of  $0.01^\circ$  and a counting time of 2 seconds per step. The corundum was determined by comparing the powder pattern obtained with that in the ICDD powder diffraction files (PDF).

The results appear in the Table 2 (for andalusite) and 3 (for corundum). The diffraction diagram for corundum is shown in the Figure 2. Finally, the andalusite density has been obtained by the picnometer method.

## FINAL CONSIDERATIONS

Both Mazán and the neighbouring Ambato fields from Pampean Pegmatitic Province are the only examples of pegmatites containing andalusite in

Argentina. At the same time, this paper represents the first mention of the andalusite-corundum assemblage in the Mazán pegmatitic field. Such paragenesis is like others found in pegmatitic localities of the world, for example, Riverside County and Yosemite National Park, in California; Kola Peninsula in Russia; and Szabo Bluff, Antarctica. Ahn et al. (1988) pointed out that muscovite and corundum are the major products of alteration of andalusite. The majority of the genetic hypotheses for the pegmatites containing andalusite-corundum keep in mind the generation of epizonal, peraluminous and  $H_2O$ -saturated melts as a main phenomenon. Aluminous metasedimentary rocks from shallow crust should be an important source of the melts.

The studies of the genesis of Mazán pegmatitic field are scarce. A priori, according Schalamuk and Ramis (1999), the peraluminous pegmatitic bodies from Mazán field can be considered transitional between muscovite class and rare-element class, associated to an anatectic process and mobilization of peraluminous granites. The age of the Mazán field are considered Ordovician due to its spatial relationship with Mazán Granite.

Table 2. Cell parameters and density of the andalusite (And) from “La Aurora” pegmatite, Mazán pegmatitic field. Upper line 1, 2, and 3 correspond to three different grinding of the mineral.

	And <sup>1</sup>	And <sup>2</sup>	And <sup>3</sup>
$a$ (Å)	7.795	7.794	7.793
$b$ (Å)	7.899	7.897	7.895
$c$ (Å)	5.554	5.566	5.560
$V$ (Å <sup>3</sup> )	342.0	342.6	342.1
$G$ (g/cc)	3,039	3,200	2,931

Table 3. *left*- XRD data and cell parameters for corundum associated to andalusite from "La Aurora" pegmatite.

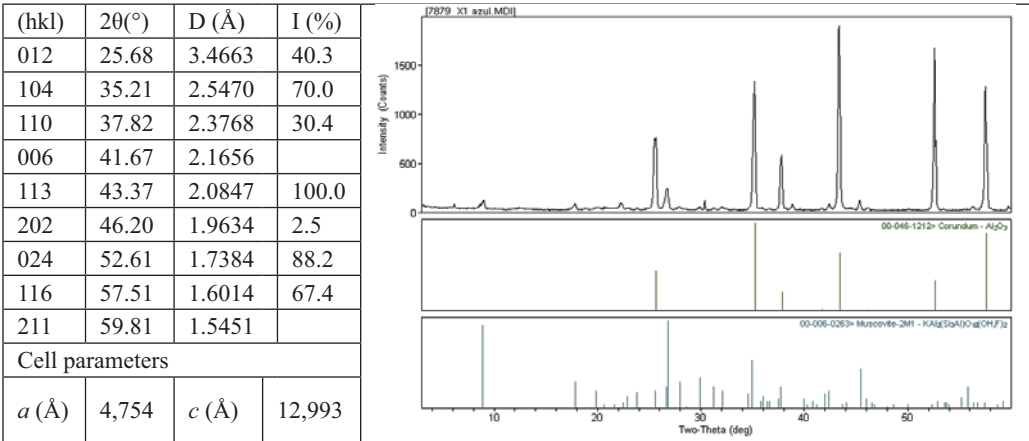


Figure 2. *right*-. XRD for corundum from "La Aurora".

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